

REMARKS

Claims 1-30 are pending. Claims 1-17 have been cancelled in previous correspondence. Claims 18-26 have been rejected under 35 U.S.C. §103. Claims 27-30 have been withdrawn from consideration. Claim 18 has been amended to incorporate the subject matter of claims 22 and 24. Claims 22, 24, and 25 are cancelled herein. Claim 21 has been amended to correct a formal matter. Claim 23 has been amended to correct the dependency of the claim. Claims 18-21, 23, and 26 remain for consideration upon entry of the present Amendment. No new matter has been added.

Claims 18-26 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,149,738 to Dahlback (hereinafter “Dahlback”). With regard to the rejections of claims 18-21, the Examiner alleges that Dahlback discloses a method of producing and treating a sheet for a component in a fuel assembly for a nuclear light water reactor substantially as claimed with a heat treatment temperature range that overlaps the claimed temperature ranges of claims 20 and 21, and that therefore a *prima facie* case of obviousness exists. The Examiner notes that Dahlback does not disclose that the sheet is stretched during the heat treatment. He then alleges that because Dahlback discloses that during the heat treatment the flatness of the sheet is restored, the Dahlback reference reads on the claimed recitation and that it therefore would have been obvious to one of ordinary skill in the art that the sheet (as in Dahlback) would have been stretched during the heat treatment in order to become flat again as desired.

Dahlback discloses a fuel box and a method for manufacturing zirconium alloy plates for fuel boxes. The method includes a heat treatment method in which the plates are  $\beta$ -quenched. According to the reference, it appears that the ductility of the material of the plates is not deteriorated by this treatment. (Dahlback, column 2, lines 57-65.) In the method, a finely lamellar basketweave structure is favorable for carrying out the bending of the plates in order to avoid cracking. (Dahlback, column 3, lines 1-3.) In manufacturing the material for the plates, alloying elements are added to zirconium to form a zirconium alloy ingot. The manufactured ingot is forged in the  $\beta$ -phase region. (Dahlback, column 5, lines 1-4.) The forging is reduced by hot rolling, and the temperature during this step is kept to a minimum. Thereafter, the material is cold-rolled in a number of steps down to the finished dimension. The material is then

$\beta$ -quenched in an effort to improve corrosion properties and ductility. A heat treatment using infrared lamps is then performed. The resulting plate material exhibits a microstructure that is characterized by the finely lamellar basketweave structure. (Dahlback, column 5, lines 15-40.)

Dahlback fails to disclose, teach, or suggest heat treating the sheet in the  $\alpha$ -phase temperature range of the alloy after producing the sheet and after carrying out a quenching operation wherein the sheet is stretched during the heat treatment, as recited in claim 18. As the Examiner admits, there is no mention of stretching during the heat treatment in the method of Dahlback, whereas claim 18 clearly recites that the sheet is stretched. Also, Dahlback fails to teach that the heat treatment step is carried out after the  $\alpha+\beta$  quenching or  $\beta$  quenching operation of the sheet, which is carried out when the sheet has been produced to a final thickness or substantially to the final thickness of the finished sheet. In fact, the heat treatment step is often the last heat treatment of the sheet in the process.

Furthermore, it should be noted that the disclosed stretching is performed during the heat treatment in the  $\alpha$ -phase region, as recited in claim 18. Dahlback fails to disclose, teach, or suggest stretching during the heat treatment, as recited in claim 18. The phase transformation of the sheet material introduces tensions into the material and may potentially cause the sheet to not be sufficiently flat. In Dahlback, as indicated by the Examiner, the final heat treatment is performed in order to improve corrosion properties and to restore the flatness of the sheet. (Dahlback, column 4, lines 52-59.) However, there is no indication that any type of stretching operation is carried out during this heat treatment. Although the final heat treatment described in Dahlback will release tensions (that have been introduced during the previous quenching operation) and will therefore contribute to the flatness of the sheet even though no stretching is performed, this contribution does not render the sheet sufficiently flat. Performing a straightening procedure on the sheet directly after the quenching step and before the final heat treatment will only introduce more stresses on the sheet, and subsequent heat treatment to release the tensions result in the sheet becoming less flat, thereby resulting in the need to perform a straightening procedure again followed by a further heat treatment to release tensions. This process can continue for several cycles. The process as recited in claim 18, on the other hand, simplifies the treatment described in Dahlback by stretching the sheet during the heat treatment, thereby causing the tensions to be released at the same time as the sheet is rendered sufficiently

flat. Accordingly, the need for any additional straightening steps with subsequent further heat treatments in order to release tensions is obviated.

Moreover, Dahlback fails to disclose, teach, or suggest that the stretching is carried out such that the sheet directly after having gone through the stretching has a remaining elongation compared to the state of the sheet immediately before the stretching, and that the remaining elongation is between about 0.1% and about 7%, as recited in claim 18. As stated above, in Dahlback the material is cold-rolled in a number of steps down to the finished dimension. Also, in Dahlback there is no stretching. In the invention as presently claimed, the stretching has an impact on the flatness of the finished sheet. Accordingly, stretching the sheet such that the sheet has an elongation compared to the state of the sheet immediately before the stretching, the elongation being between about 0.1% to about 7%, as recited in claim 18, is not the same as a process in which there is no stretching, as in Dahlback.

Also, the step of stretching the sheet during the heat treating process as recited in claim 18 produces at least two unexpected results. First, improved corrosion properties are achieved since the heat treatment makes it possible for secondary phase particles to grow in the material of the sheet. Because the sheet is stretched during the heat treatment, the growth of secondary phase particles takes place faster since the stretching process increases the diffusion speed. Second (and on a related note), since the heat treatment during the deformation leads to a considerably faster diffusion rate, it becomes possible to control the degree of growth of secondary phase particles through the applied deformation.

Because Dahlback fails to disclose, teach, or suggest heat treating the sheet in the  $\alpha$ -phase temperature range of the alloy after producing the sheet and after carrying out a quenching operation wherein the sheet is stretched during the heat treatment, wherein the stretching is carried out such that the sheet directly after having gone through the stretching has a remaining elongation compared to the state of the sheet immediately before the stretching, and wherein the remaining elongation is between about 0.1% and about 7%, as recited in claim 18, Dahlback fails to teach all of the claim recitations of Applicants' invention. Consequently, because not all of the claim recitations are taught by the cited reference, claim 18 is necessarily non-obvious, and Applicants respectfully request that the Examiner withdraw the rejection of claim 18.

Claims 22, 24, and 25 have been canceled as indicated above, thereby rendering the Examiner's rejection thereof moot.

Claims that depend from a claim that is non-obvious are themselves necessarily non-obvious. Because claims 19-21, 23, and 26 depend from claim 18, and because claim 18 is asserted to be non-obvious for the reasons presented above, claims 19-21, 23, and 26 are necessarily non-obvious. Applicants, therefore, respectfully submit that claims 19-21, 23, and 26 are allowable. Accordingly, Applicants respectfully request that the rejections of claims 19-21, 23, and 26 be withdrawn.

Applicants believe that the foregoing amendments and remarks are fully responsive to the Office Action and that the claims herein are allowable. An early action to that effect is earnestly solicited.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants believe that no fees are due with the submission of this Amendment. If any charges are incurred with respect to this Amendment, they may be charged to Deposit Account No. 503342 maintained by Applicants' attorneys.

Respectfully submitted,

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